INTERMEDIATE ALGEBRA

These questions will test your knowledge of operations involving the quadratic formula; radical and rational expressions; inequalities and absolute-value equations; algebraic and geometric sequences; systems of equations; logarithms; roots of polynomials; and complex numbers. Intermediate Algebra questions make up approximately 15 percent of the ACT Mathematics Test.

Difficulty Level: Easy

1. The geometric mean of 2 positive numbers is the square root of the product of the 2 numbers. What is the geometric mean of 4 and 49?
   A. 9
   B. 14
   C. 26
   D. 98
   E. 196

2. If x is a real number such that $x^3 = 729$, then $x^2 + \sqrt{x} = ?$
   F. 9
   G. 27
   H. 30
   J. 84
   K. 90

3. What two numbers should be placed in the blanks below so that the difference between the consecutive numbers is the same?

   13, ___, ___, 34
   A. 19, 28
   B. 20, 27
   C. 21, 26
   D. 23, 24
   E. 24, 29

4. The first 5 terms of a geometric sequence are 0.75, −3, 12, −48, and 192. What is the 6th term?
   F. −768
   G. −144
   H. −75
   J. 132
   K. 255.75

Difficulty Level: Medium

5. What is the solution set of $|2a - 1| \geq 5$?
   A. $\{a: a \leq -4 \text{ or } a \geq 6\}$
   B. $\{a: a \leq -3 \text{ or } a \geq 3\}$
   C. $\{a: a \leq -2 \text{ or } a \geq 3\}$
   D. $\{a: a \geq 3\}$
   E. { } (the empty set)

6. If the following system of equations has a solution, what is the x-coordinate of the solution?

$$x + 6y = 24$$
$$3x + 6y = 52$$

F. 0
G. 6
H. 14
J. 19
K. The system has no solution.

7. For a single production run, when x items are made and sold, a company's profit, D dollars, can be modeled by $D = x^2 - 300x - 100{,}000$. What is the smallest number of items that must be made and sold in order for the company not to lose money on the production run?

A. 150
B. 200
C. 300
D. 350
E. 500

Difficulty Level: Hard

8. If $-4 \leq a \leq -3$, and $2 \leq b \leq 5$, what is the maximum value of $|a - 2b|$?

F. 7
G. 8
H. 13
J. 14
K. 20

9. For all positive integers n, which of the following is a correct ordering of the terms n^n, $(n!)^n$, and $(n!)^{n!}$?

A. $(n!)^{n!} \geq n^n \geq (n!)^n$
B. $(n!)^{n!} \geq (n!)^n \geq n^n$
C. $n^n \geq (n!)^n \geq (n!)^{n!}$
D. $(n!)^n \geq (n!)^{n!} \geq n^n$
E. $(n!)^n \geq n^n \geq (n!)^{n!}$

10. Whenever a, b, and c are positive real numbers, which of the following expressions is equivalent to $2\log_3 a + \frac{1}{2}\log_6 b - \log_3 c$?

F. $2\log_3(a - c) + \log_6\left(\frac{b}{2}\right)$
G. $\log_3(a - c) + \log_6(\sqrt{b})$
H. $\log_3\left(\frac{c}{a^2}\right) + \log_6\left(\frac{b}{2}\right)$
J. $\log_3\left(\frac{a^2}{c}\right) + \log_6(\sqrt{b})$
K. $\log_3\left(\frac{a^2 b}{c}\right)$